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ABSTRACT

This study explored elementary school teachers' personal experiences with computer usage in instruction, and identified factors related to computer usage in their own teaching. Participating in the study were 149 teachers from 15 elementary schools selected randomly from 2 counties in western New York, representing a 75 percent return rate. Respondents completed a 46-item survey on their experience and interest in the use of computers in instruction, their training on and knowledge about computers, their comfort level in using computers for teaching, and current computer usage in classroom instruction. The findings indicated that 56 percent of the teachers had prior computer experience, with 80 percent currently using computers for less than 1 hour each day. Teachers typically received training through their district, but thought that the assistance in using computers for classroom instruction did not meet their needs. Teachers were comfortable using computers and thought the computers would enhance their teaching. They tended to use computers as a tutorial aid for students, for drill and practice, and as a general tool. Teachers' computer experience and interest were correlated with their computer usage score. Their computer training and knowledge level was also correlated with computer usage. In addition, teachers' comfort level in using computers was correlated with computer usage. There were no statistically significant effects of gender or teaching experience on teachers' use of computers in the classroom. (The survey is appended. Contains 27 references.) (KB)

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Digital linkage: Factors related to elementary grade teachers' usage of Computers in classroom instruction

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Digital linkage: Factors related to elementary grade teachers' usage of Computers in classroom instruction

The study explored elementary grade teachers' personal experience with instructional computing, and revealed the factors related to their computer usage in the teaching methods. One hundred forty nine teachers, from 15 elementary schools randomly chosen from two counties in Western New York, participated in the study. Teachers answered a survey questionnaire on their experience and interest in instructional computing, their training and knowledge in computers, their comfort level in using computers for teaching, and computer usage in classroom instruction. Teachers' responses would allow educators to review the course curricula, discuss possible change in teaching methods, and make educational reforms to adapt to a more technologically advanced society. Further this study indicated no statistically significant effect of gender or teaching experience on teachers' use of computers in the classrooms.

INTRODUCTION

The digital revolution has transformed our society into the world of bits and bytes. The proliferation of computers in every aspect of life has propelled further usage of computer-aided devices and gadgets, which were totally unheard of in recent years. From baby nursery to the robot landing on mars, the feasibility of computer applications knows no bound. Children are prolific users of these digital gadgets; with their little fingers they shift buttons with amazing speed or maneuver the modules to play computer games; in most cases, either they are protecting their homeland from the blazing lasers of the aliens from krypton, or they are swerving away from the onrushing Indy'500 race

cars. Sometimes, the ninjas would come on the screen to do occasional tricks with their swords. These computer games are in millions and children love them dearly. Keeping with pace of the newer technological innovations, these games are constructed or devised accordingly. These digitally produced images are so well constructed that the interactions with the players create close to live situations. These little gadgets provide a stepping stone for the children, whose then enter a new playing field – a larger monitor, a faster processor with a sound card to create a full fledged entertainment center. With a click of the mouse, children explore their world of excitement. This gives them a first hand experience with computers and also establish a formal introduction to the device. As more children become conversant in using computers, their inquisitive minds go beyond limits; they turn to their teachers, as they are the ones who are children's guide to formal education. Teachers must rise to the occasion to meet children's demands, and they all feel the need to make themselves literate in technical sense. It is the societal demand that every school needs to meet and gradually cope with. It is not easy but change is for good in the long run. At all levels of education there is continued increase in use of the computer. Computing proficiencies are increasingly being expected of the members of the teaching profession. The challenge to the educator is to learn how effectively use it in the classrooms. Previous research indicates teachers felt inadequate and frustrated by their limited knowledge and efficiency in computer usage in the classroom (Bychowski and Van Dusseldorp, 1984). As Preskill (1988) stated the kinds of feelings that teachers' have towards computers range anywhere from hostility, to fear, to euphoria. This argues the need for teachers' preparation for learning computer skills and furthermore advocates that it is necessary for teachers to use computers in classroom instruction. Since teachers

interact with the students on a regular basis, they are the ones who should be comfortable in the newer instructional practices by using computers as one of their teaching tools; they need to be comfortable in their own computer knowledge and skills before they administer new instructional techniques and have students use it. Teachers need to experience various computing processes that enable them to offer more to children. Not only the teachers need to become more comfortable with the associated attitudes but also with the accompanying techniques. After all, the ultimate aim is to help students develop computer skills for further application so that they are aware of the technology and that they be adaptive to changes along with the developmental process. If computers can assist teachers in the overall teaching process and benefit the students then there is a good reason to welcome their appearance (Adams, 1985). If the instruction begins at the elementary level then the teachers will feel comfortable in adopting the training process, which perhaps will be comparatively suitable for them. This can occur in a phased manner so that proper understanding of classroom training is obtained, which is beneficial for students, teachers, and school towards fulfillment of the objective.

Teachers require certain competencies in the computer usage. Research conducted by Niederhauser, and Stoddart (1994), examined teachers' beliefs about computer assisted instruction relating to the instructional software they use, types of computer related activities they provide to their students, if they received training in using computers, and whether they integrate computers in their teaching. Results indicated that some teachers believe that computers are tools that students use to collect, analyze, and present information, while others believe that teachers can integrate the use of computers in their instruction process; and that elementary teachers favored a more

transmission oriented view on the effective use of computers. Lacina (1984) pointed out that although computer aided instruction is very much needed, teachers cannot teach using computers if they are not competent. Ely (1993), described computer usage in schools and universities and further hypothesized about non-use, limited-use, and inappropriate use. He noted: "most teachers who become involved in computer-based instruction are never the same again...." For a teacher to implement new form of instructional method through computers, thorough training in computers is needed so as to impart the same value of teaching through the new media.

Spotts and Bowman (1995), noted that "the impact of computers on elementary and secondary education continues to grow rapidly," yet "only a small minority of teachers [and students] could be said to be major computer users...." (Becker et. al., 1991) Novak's (1991) research explored "beginning elementary teachers' ... in their new role as a teacher, do not emphasize on computer usage simply because they view computers as "extra" and "special" and not as a tool to enhance teaching or instructional methods. Sheingold and Hadley (1990) indicated five highest barriers to the use of computers with teachers already using computers; they are: lack of time, scheduling computer time, too few computers, not enough time in school schedule for computer-based instruction, and inadequate financial support for computers. Further, several reasons that prevent implementation for those who were not currently using computers in the classroom were dissatisfaction with the status quo, insufficient knowledge and skill, lack of resources, available time, commitment from supervisors, lack of inspiration from leadership contingents, lack of rewards or incentives, and participation expected, not shared (Ely, 1993). Winnans and Brown (1991) indicated

self-efficacy and confidence are major issues that affect elementary teachers use of computers. Other factors included, lack of computer resource person in the school for them to seek assistance if situation arises, limited use of computer related sources and materials provided by the district, and the limited number of computers that were available to them.

Some teachers don't believe that the computer improves learning outcomes (Wiske, et al, 1990). Some teachers resent the computer because they see it as a competitor for the student's attention (McMahon, 1990), lack of administrative support and increase investment of time (Cuban, 1989), fearsome non-users scared of losing control of "center stage" and others feared "looking stupid" in front of the students (Wiske et al. 1990).

As suggested by Adams (1985) "implementing computers in the classroom requires more than mechanical change by the teacher. There is the extremely important element of personal change. There is the potential for change in the whole spirit of the classroom with the teacher acting as a resource person, assisting learning in a more informal, independent, and non coercive environment." Investigation by Evans (1995) indicated that teachers exert their autonomy and discretion when they respond to technical change in the elementary schools.

According to Hannifin and Savenye (1993) poorly designed software applications and lack of time to design their own software often cause teachers to give up using computers at the early stages of adoption into the classroom. In the research study relating to computer usage by the elementary teachers in a rural school, Frase (1996) indicated that teachers were forced to use pre-installed software that were available

through the network. These programs, however, were chosen by school district authorities and teachers had no choice in selecting computer programs that they felt would meet individual needs of their students. Research by Frase (1996) also revealed the state of frustration among elementary teachers in not being able to voice their needs to use computers. The perspective of teachers is of equal importance and should be considered in preparation for classroom teaching. Teacher preparation should emphasize how computers can improve the performance of students through the appropriate teaching methods and support of teachers' commitment to the curriculum and their relative expectations. There is a need to understand the state of the art regarding computer-aided instruction and of teachers' computer usage in the classroom.

Studies indicated the need for computer training for teachers, and cited the importance of computers in classroom teaching. Few studies have been done to investigate elementary teachers' perception of computer usage in classroom instruction. It also seems plausible to investigate whether or not computer training provided to the teachers is appropriate, relevant and adequate from the teachers' perception. The attitudes that teachers have towards teaching computers to elementary students and their feelings about being held accountable for teaching computers need to be analyzed to further understand what needs to be done to better prepare teachers to use computers in the classroom. The purpose of the study is to explore the factors relating to elementary grade teachers' perceptions of computer training and usage, their personal experience with instructional computing, and their views on current use of computers in classroom instruction.

Studies indicated teachers' gender and teaching experience have effect on their computer usage in the classroom; however, some other research reported no effect of gender or level of teaching experience on teachers' computer usage. Thus it needs to be examined if teachers' gender or experience level have any effect on their computer usage in classroom instruction.

Gender Related Issues in Teachers' Computer Usage

Survey data by Becker (1991) and the Center for Social Organization on gender related issues in computer usage indicated the following: "results appear to support current research and writings suggesting that gender differences exist both in computer attitudes and computer aptitudes" (Chen, 1986, Collis, 1986, 1989). The data, although not in the elementary grade levels, seem to support the general notion that computer usage in the classroom lags behind our expectations. Further, this data suggests that there may be differences between gender related to computer usage. However, research study by Stasz and Shavelson (1986) in 49 schools in California indicated that gender was unrelated to teacher's subject matter and computer knowledge, patterns of microcomputer-based instruction, and instructional decisions and practices. Also, in surveying 112 teachers from 26 schools, McCoy, and Haggard (1989), found that gender had no effect on whether or not teachers used computers in their instruction. However, Woodrow (1989) cited Chen (1986) who stated about the difference between male and female teachers in their computer applications in classrooms, but in her own study done with 75 teachers at two suburban secondary schools near Vancouver, Canada, Woodrow found no significant differences in computer application knowledge and usage between the male and female teachers in the study group.

Level of Teaching Experience in Teachers' Computer Usage

A research study by Hannaford (1988) at Washington State University with 36 graduate students, who served as inservice teachers, and 37 undergraduate students, who served as a preservice sample, focused on instructional use of computers in the classroom by inservice and preservice teachers. Cross tabulations were used to determine the variations in responses to computer usage by years of teaching experience. Three categories were used: preservice, 5 years or less teaching experience, and more than 5 years of teaching experience. For the preservice teachers, the elementary respondents indicated more involvement than the secondary respondents, for teachers with less than 5 years of teaching experience, the computer usage was low, and teachers with more than 5 years experience indicated a high involvement in computer usage. Hence, the research supported the significance of teaching experience with computer usage. Furthermore, study by McCoy, and Haggard (1989) involved 81 teachers in 26 schools within a regional area in the United States, to find if there were any relationship between teaching experience and computer usage by the school teachers. The results of the multiple regression produced significant positive beta weights, indicating that computers were used more by more experienced teachers at the elementary grade levels. Research by Woodrow (1989) with 75 teachers at secondary schools in Vancouver, Canada, explored if teaching experience had any influence on teachers' education applications of computers. Teachers were divided into four groups: Group #1 - 1 to 6 years of teaching experience, Group #2 - 7 to 11 years, Group #3 - 12 to 16 years, and Group #4 - 17 to 34 years. Results indicated that teaching experience was not significant with the familiarity and usage of computers in classrooms.

METHOD

Sample

Fifteen elementary schools were randomly chosen from Erie and Niagara Counties in Western New York. These two counties are the most populous of the eight Western New York counties. From the selected schools, teachers willing to participate were the subjects of the study. A total of 200 survey questionnaires were distributed to these teachers. One hundred and forty-nine teachers responded. This represents a return rate of 74.5%.

Of the 149 teachers who responded, 124 were female and 25 were male. Thirty-two teachers had a Bachelors degree and 117 teachers had a Master's degree. A majority of the teachers (91 or 61%) reported teaching at grade levels PreK-3, 55 teachers (37%) were teaching at grade 4-6, and three specialty teachers (2%) stated teaching at all grades PreK-6. With regard to their teaching experience, 86 teachers (58%) had more than ten years of teaching experience, 33 teachers (22%) had between 6-10 years and 30 teachers (20%) had less than 5 years of teaching experience.

Instrument

A five page, 46 item close-ended questionnaire was developed and also modified from previous assessment instruments in the area of instructional computing (Lloyd-Kolkin & Tyner, 1988; Mergendoller et al., 1992; Peters et al., 1995; Price & Brunson, 1986; Smith, 1995). The format of the questionnaire was adopted from an instrument developed by Milbrath & Doyno (1987). Kahn et al. (1957) indicated that close-ended questions were appropriate when the objective was limited to the classification of the

respondent with respect to some attitude or perception. The survey questionnaire of this research consisted of five sections - Demographic information, and Sections A, B, C, and D. The first section of the questionnaire contained the demographic information of the respondent. It began with respondent's gender, followed by his or her educational background, the years of teaching experience, the teaching grade level, class size, type of computers in respondent's school for students' use , number of computers available, students' accessibility to computers, and the level of encouragement that respondents received from their respective supervisors.

There were eight questions in Section A, which evaluated teachers' experience and interest in computers. This section gathered data on teachers' experience and familiarity with computers, accessibility to computers outside schools, if they read and subscribed to any computer related journals or magazines, how much time they spent using computers and how many times they received technical help in using computers.

Section B consisted of seven questions, and measured teachers' perceptions of their computer training and knowledge. Responses to the questions in this section reflected teachers' opinions on the training opportunities they received, whether they took advantage of those opportunities offered within or outside the school districts, teachers' views on their schools' technological resources, and technical assistance available, teachers' perception about their computer knowledge.

There were nine questions in Section C that probed into teachers' level of comfort in using the computer. Specifically, the questions elicited teachers' responses relating to their comfort level in using computers in the classrooms, their beliefs in enhancing teaching abilities through computers, and teachers' level of interaction with the students

relating to computers. Also, the questions aided in teachers' self assessment on the effect of computer aided instruction in their teaching methods, by integrating computers in curriculum and in motivating the students.

Lastly, the eleven questions in Section D explored teachers' computer usage. Responses to each of the question items reflected teachers' views on their using computers as a tutorial aid or in updating students' records. The questions sought to determine if teachers used computers to help students develop concepts, in problem solving, for drill and practice and for instructional games. Other questions further probed into teachers' computer usage as a general tool for e-mail purposes or to retrieve information through Internet. The section concluded with questions relating to the extent of teachers' using computers to help students create and use presentation graphics and the extent to which they planned curriculum instruction with integration of technology in their mind.

Questions in the last three sections were structured in a five point Likert-type scale ranging from **Strongly Agree** to **Strongly Disagree**. The questions in these sections also elicited "NA" (Not Applicable) responses, however, those were not considered for scoring purposes.

Scores in the upper 20% were considered as higher scores and those in the lower 20% were considered as lower scores.

Reliability of the Instrument

In order to assess the reliability of the instrument, pilot testing was performed. Questionnaires were given to other 23 non-randomly selected teachers from schools in Erie and Niagara counties of Western New York. Alpha Reliability coefficients were computed for each section and are shown as follows:

	Alpha Reliability Coefficient
*Section A: Computer Experience & Interest	0.65
Section B: Computer Training & Knowledge	0.76
Section C: Computer Comfortability	0.59
Section D: Computer Usage	0.61

*Section A elicited teachers' responses on their computer experience and interest.

Validity of the Instrument

The researcher assessed the instrument for face and content validity. Subjects in the pilot study were asked if they felt these items measured the concept that they were designed to measure. Eight judges were also asked to give their opinions about the validity of the sections described earlier. Among these eight judges who reviewed the questionnaire; six of them were University faculty members, one was an elementary school teacher, and the other person was teaching in an area college. Two of the faculty members and two other judges were involved professionally in the field of instructional technology. All of the eight judges approved the questionnaire.

Design of the Study

Variables

Since the purpose of the study was to determine use of computers as an instructional tool, "Computer Usage" was the dependent variable. The eleven questions

in Section D were the measures of the dependent variable. Computer Experience & Interest, Computer Training & Knowledge and Computer Comfortability are three independent variables. These were then, the measured data. The other two independent variables of the study were: Gender, having two levels - Male and Female and Teaching Experience , having three levels - Low, Moderate and High.

These levels were arbitrarily defined as follows:-

a) Low Teaching Experience is between 0 to 5 years

b) Moderate Teaching Experience is between 6 to 10 years.

c) High Teaching Experience is more than 10 years. These were then, the observed data.

Statistics employed in data analyses included Mean, Standard deviation, and Correlation and 2 factor Analysis of Variance. The study involved correlation to determine if Computer Experience & Interest, Computer Training & Knowledge and Computer Comfortability correlated with computer usage. To determine if Gender and Teaching Experience had any effect on Computer Usage, a 2 Factor Analysis of Variance was conducted.

Research Hypotheses

The purpose of the study was to examine the perceptions of teachers in regard to computer Training and Knowledge, how do they feel comfortable with computers and how do they use computers for classroom instruction.

The research hypotheses are as follows:

$\mathbf{H_1}$: There is a positive correlation between teachers' Computer Experience and interest and their Computer Usage.,

H_2: There is a positive correlation between teachers' Computer Training and Knowledge and their Computer Usage.

H_3: There is a positive correlation between teachers' Computer Comfortability and their Computer Usage.

These hypothesis was tested using Pearson "r" correlation.

H_4: Male teachers' Computer Usage score is significantly greater than those of the female teachers'.

H_5: Teachers with little (low) Teaching Experience have lower Computer Usage scores than teachers with moderate Teaching Experience who in turn will have lower scores in Computer Usage than teachers with more (high) Teaching Experience. Hypotheses 4 and 5 were tested using 2 x 3 factor analysis of variance.

RESULTS

Survey responses revealed that 56% of the teachers reported having prior experience with computers. In investigating how much initiative the teachers took to gain knowledge in computers, results indicated that 70.5% of the teachers read no computer journals, about 27% read computer journals on a monthly basis and 2.7% of the teachers read them on a weekly basis. Further, 93% of the teachers mentioned subscribing to no computer journal or magazine. As to the actual use of the computer, a majority (80.5%) of the teachers acknowledged using computers for less than an hour, 17.4% used them between 2 to 3 hours and two (2%) percent of the teachers used computers for 4 to 5 hours a day.

The Mean score and standard deviation with respect to their Computer Training and Knowledge (Section B) was 18.38 (5.83)), significant at $p < 0.05$.

Table 1. Mean scores for each question in Section B (Computer Training and Knowledge).

Section B (Computer Training and Knowledge) Teachers n=149		
Category	**Mean**	**SD**
1. District provided training	3.49	(1.46)
2. Availed training by district	3.10	(1.94)
3. Availed training outside district	1.15	(1.18)
4. School is well equipped with computers	3.28	(1.31)
5. Assistance available in school	2.70	(1.37)
6. See myself more knowledgeable	2.43	(1.33)
7. Others see me as more knowledgeable	2.21	(1.40)

Please note: * means that the *t*-values are significant at $p < 0.05$

As seen from Table 1b, with respect to item 1, teachers stated that the school district provided computer training (mean score: 3.49, (1.46)).

Examining items 2 and 3, it could be stated even if the training opportunities were provided within or outside their school districts, most teachers did not take the opportunity (training within district: 3.10, and training outside district: 1.15).

With respect to item 4, the teachers viewed as a little more than average in regard to the schools equipment with computers and instructional technology (3.28).

Examining item 5, when using computers for classroom instruction assistance was not available to the extent of their needs. (2.70)

In items 6 and 7, responding to the questions on self evaluation, teachers' view about their competency was rather low in using computers (2.43) and also they believe that their peers or other school personnel (2.21) view them low too.

The Mean score and standard deviation for teachers' scores with respect to their Computer Comfortability (Section C) was 28.86 (8.41)), significant at $p < 0.05$.

The differences in responses on each individual item were also examined.

Table 2 shows the results obtained in each question in Section C.

Table 2. Mean scores, and standard deviations in Section C (Computer Comfortability).

Section C (Computer Comfortability)
Teachers
n=149

Category	**Mean**	**SD**
1. Comfortable using computers	3.38	(1.35)
2. Computers enhance teaching abilities	3.56	(1.25)
3. Comfortable discussing computers	3.17	(1.33)
4. Intimidated by students' question	3.23	(1.34)
5. Computers improve student performance	3.78	(1.18)
6. Computers help individualized instruction	3.35	(1.52)
7. Number of students in computer integration	1.95	(1.35)
8. Computers increase students' motivation	3.36	(1.56)
9. Traditional methods as effective as CAI	3.05	(1.31)

Please note: * means that the *t*-values are significant at $p < 0.05$

In Table 3b with respect to item 1, data indicated that teachers view themselves above average in their level of comfort in using computers. (3.38). Furthermore, examining items 2 and 3, teachers believed that computers would enhance their teaching ability (3.56) and also that they regard themselves to be comfortable discussing computer topics with their students (3.17).

However, results from item 4 suggested, that if computers were to be used in classroom instruction, teachers are intimidated by students' questions (3.23).

In item 5, teachers' response indicated that they see instructional computing improve students' performance (3.78).

Also, in item 6, the teachers viewed that computer aided instruction effectively facilitate individualized instruction (3.35).

With respect to item 7, mean score of (1.95) was rather too low according to what they perceived as their ability to integrate computers in the classroom in presence of large number of students.

From item 8, it could be stated that a majority of teachers' viewed that computers should be used in classrooms to increase students' motivation.

Responding to item 9, on traditional methods of classroom instruction being as effective as computer aided instruction, teachers' response was low (2.92).

The Mean score and standard deviation of teachers' score with respect to their Computer Usage in classroom instruction (Section D) was 27.72 (10.69), significant at $p < 0.05$.

Table 3 shows the results obtained in each question in Section D.

Table 3. Mean scores, and standard deviations of each item in Section D (Computer Usage in classroom instruction).

	Teachers n=149	
Category	**Mean**	**SD**
1. Use computers as a tutorial aid	3.09	(1.52)
2. Use computers for students' records	2.52	(1.79)
3. Use computers for developing concepts	2.80	(1.53)
4. Use computers for problem solving	2.59	(1.44)
5. Use computers for drill and practice	3.42	(1.38)
6. Use computers for instructional games	3.00	(1.52)
7. Use computers as a general tool	3.64	(1.66)
8. Use computers to access information	2.07	(1.79)
9. Use computers for Listserv	0.73	(1.09)
10. Use computers for presentation graphics	1.51	(1.56)
11. Plan curriculum with computer integration	2.27	(1.47)

Please note: * means that the *t*-values are significant at $p < 0.05$

With respect to item 1, the mean score data given in Table 3b suggested that more than average teachers use computers as a tutorial aid for students teaching situation (3.09).

Examining item 2, it could be stated that less than average teachers use computers to maintain and update students' records (2.52).

In item 3, less than average number of teachers stated that they use computers (2.80) to help students develop concepts.

With respect to items 4 and 5, less than average number of teachers' responses indicated that they use computers (2.59) for teaching students problem solving but more

than average number of teachers use computers for teaching students drill and practice (3.42).

Responding to their views on computer usage to teach instructional games, in item 6, responses yielded average score (3.00).

More than average number of teachers are willing to use computers as a general tool in item 7 (3.64).

Next three items 8, 9 and 10 referred to computer usage to access information (2.07), using computers for Listserv (0.73), and for creating and using presentation graphics(1.51) were rather too low.

Lastly, in item 11, when asked, if they plan to integrate technology in curriculum instruction, less than average number of teachers' responses clearly indicated that they do not plan to integrate computers in the curriculum.

Analysis of Correlation

In order to determine if teachers' experience and interest in computers were related to their computer usage, scores obtained through the teachers' responses were correlated. Similarly, teachers' responses relating to computer training and knowledge, and also their computer Comfortability were correlated with their computer usage. These responses were represented by the rating scale scores for each of the measured variables.

The **first** hypothesis predicted a direct positive relationship between teaching experience and interest and the computer usage. More explicitly, teachers with more computer experience and interest would use computers more frequently in the

classrooms. Since the scores for the question items were in interval scale, the Pearson's "r" statistic was used.

Teachers' computer experience and interest was correlated with teachers' computer usage score. The correlation coefficient, r = 0.35 indicated a low positive correlation. The value was statistically significant at alpha level 0.05.

Thus the first hypothesis was accepted.

The **second** hypothesis predicted a direct positive relationship between teachers' computer training and knowledge and the computer usage. To elaborate, teachers' having more training and knowledge in computers would use computers more frequently in the classrooms. In this situation, since scores for the question items were in interval scale, the Pearson's "r" statistic was used.

Total scores obtained in Section B (teachers' computer training and knowledge) was correlated with teachers' scores in Section D (computer usage) in corresponding situations.

Teachers' score in computer training and knowledge was correlated with teachers' score in computer usage. The correlation coefficient obtained was, r = 0.52 and indicated a moderate positive correlation. This value had statistical significance at alpha level 0.05.

Thus the second hypothesis was accepted.

The **third** hypothesis predicted a direct positive relationship between teachers' scores in computer Comfortability and scores obtained in computer usage rating scale. It stated that teachers' having high score in computer Comfortability rating scale would use computers more often in classroom instructions. The computed Section C (teachers'

computer Comfortability) scores was correlated with the scores in Section D (teachers' computer usage).

Teachers' score in computer Comfortability was correlated with teachers' computer usage score. The correlation coefficient was found to be, $r = 0.72$ and represented high positive correlation. This value was statistically significant at alpha level 0.05.

Thus the third hypothesis was accepted.

Analysis of Variance

The test objective was to find the effect of variables on one another (the independent variable on the dependent).

H_4: Male teachers' Computer Usage scores is significantly greater than those of female teachers.

The **fourth** hypothesis stated that male teachers' scores were not equal to female teachers' score in their computer usage.

H_5: Teachers with little (low) Teaching Experience have lower Computer Usage score than teachers with moderate Teaching Experience, who in turn will have lower Computer Usage score than teachers with more (high) Teaching Experience.

The **fifth** hypothesis indicated that teachers' computer usage would be different in accordance with their level of teaching experience (low, moderate and high).

To determine if there was any gender or teaching experience level effect, a 2 x 3 factor ANOVA was administered. Results indicated that there was no significant effect of gender on computer usage, $F(1, 142) = 0.03$. **Thus the fourth and fifth hypotheses were rejected**.

Table 4 gives the Analysis of Variance of Section D (Computer Usage)

Table 4. Analysis of Variance of Section D (Computer Usage)

Analysis of Variance					
Source of Variation	**Sum of Squares**	***df***	**Mean Square**	**F**	**Sig. of F**
Main Effects					
Gender	3.484	1	3.484	.030	.863
Experience	42.745	2	21.373	.182	.833
Gender x Experience	47.711	2	23.856	.204	.816
Explained	292.118	5	58.424	.499	.777
Residual	16632.125	142	117.128		
Total	16924.243	147	115.131		

Table 5 presents Cell Means of Section D (Computer Usage) by Gender x Experience

Table 5. Cell Means of Section D (Computer Usage) by Gender x Experience.

		Experience Level		
		Low	**Moderate**	**High**
Gender	**Male**	28.57 (7)	28.67 (6)	28.75 (12)
	Female	28.04 (23)	30.15 (26)	26.49 (74)

DISCUSSION

The study reflected elementary grade teachers' perspective on computer usage, utility, training needs and availability of computers at school level. It is important for educators to know the current state of education and training that teachers have in computers, what their needs are, and how schools and school districts could assist

teachers in gaining confidence and knowledge in the computer field so that they could impart the same to their students.

At first, sample demographics were obtained. Female teachers constituted 83% of the respondents and 17% were male teachers. Nevertheless, there was no statistically significant "Gender effect", as indicated by analysis of variance results. Results indicated that a majority (78%) of the respondents had Masters' degree. Fifty-eight percent (58%), of the teachers had more than ten years of teaching experience. Nevertheless, the analysis of variance indicated no statistically significant effect of teaching experience with regard to computer usage.

Teachers' responses indicated that more than 50% of the teachers did not have prior experience with computers, resulting in less computer usage. About 80.5% of teachers indicated using computers for less than one hour a day and only 2% of the teachers use computers for 4 to 5 hours a day. This poses an important question - are teachers comfortable in using computers in classrooms? The mean score (3.38) implied that more than average, the teachers are comfortable in using computers. When computer training was provided to elementary grade teachers, the responses indicate that more than average number of teachers availed the opportunity. The study also examined the elementary grade teachers satisfaction with the training they received and the extent to which they desired more training. Mean score results obtained from survey indicated that more than average were satisfied. (3.49). However, teachers stated that in reality they often did not take any initiative to take training outside their school district when offered. Also, most of the teachers did not avail themselves of the computer training offered within the school district. Thus, whether training was offered within or outside school

district, not all teachers took advantage of these training opportunities. This raised two important questions - i) were the training appropriate for teachers? or ii) were there other factors discouraging or preventing teachers from utilizing training opportunities? It seemed logical to conclude that unless teachers get adequate and appropriate computer training, they could not assist children to use computers at the optimum level.

It is important that teachers be given the opportunities to rethink and analyze their usage of computers in the classroom on the basis of training they received, how much training they desired, how competent were they, and how comfortable did they feel with computers in classrooms. Teachers' responses indicated that in all three categories, they were not content with current sate of affairs.

Analyzing teachers' scores obtained from the survey, a positive correlation ($r = .35$) was found between computer experience and interest and their computer usage. Inspite of low correlation, the value was statistically significant. These results indicated that teachers having computer experience and interest would use computers more in the classrooms. It also suggested that schools were making progress in this area and must continue their efforts. The teachers responded that computers improve student performance (mean score: 3.78), helps individualized instruction (mean score: 3.35) and increase students' motivation (mean score: 3.36).

CONCLUSIONS

Based on teachers' responses, high and positive correlation between teachers' computer experience and interest and subsequent computer usage supports the relationship. A positive relation was also found between computer training and computer

usage in classroom instruction. Data indicated a positive correlation between teachers' perceived computer knowledge and computer usage. Further, a positive correlation showed a relationship between teachers' level of comfort in using computers and their computer usage in current situation.

All teachers at elementary grade levels, irrespective of their prior teaching experience, should be computer proficient and competent in computer instruction. The fact that most teachers did not avail computer training opportunities, the effectiveness of training must be examined. Due to rapid technological changes, schools should update resources and continue providing training and workshops for teachers; this would not only improve the quality of teaching, but at the same time it will benefit students. With progress of time, school's adaptation to this new change will induce smooth transition, and will not cause hysteria among school teachers to leap from a lower orbit to the position of a much higher orbit of technologically advanced teaching practices. Therefore, to the benefit of all, school districts must create an exhaustive plan to make the resources available to each school to promote computer use, reduce the inequality of resources among schools, and assist teachers gear themselves up to confront the rampage of the bytes .

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Appendix A
SURVEY QUESTIONNAIRE
Elementary Grade Teachers' Perception of Computer Training and Usage for Classroom Instruction

Demographic Information

1. Gender (circle one) : Male Female

2. Highest Degree earned : _____

3. Major : _____ _____
   Undergraduate Graduate

4. How long have you been teaching? : 0-5 years 6-10 years more than 10 years

5. Grade level you currently teach : PreK-3rd grade 4 - 6th grade

6. Class enrollment (present average class size if more than one) : _____

7. Average daily class attendance : _____

8. Type of computers available for your students' use at school : _____

9. Number of computers available for your students at school : _____

10. How often do your students have access to computers at school? : daily weekly monthly never

11. To what extent does your supervisor encourage you to integrate computers into the curriculum. : never seldom usually frequently

SECTION - A
(Computer Experience & Interest)

Please answer the following questions:

1. Did you have any prior experience with computers? (in job or academic) : Yes No

   If **Yes**, how many years? : 0 0-5 years 6-10 years more than 10 years

2. How would you describe your own familiarity with computers? : unfamiliar introductory familiar familiar "I am a computer wizard"

3. Do you have an access to a computer outside the school? : Yes No

   If **Yes**, how often do you use it? : daily/ almost weekly/ almost monthly/ almost never/ almost

4. How often do you read any computer journal or magazine? : daily/ almost weekly/ almost monthly/ almost never/ almost

   Please name any computer journals or magazines you read. : _____

5. Do you subscribe to any computer journal or magazine? : Yes No

   If **Yes**, please name. : _____

6. How often do any of your immediate family members residing in your household use computers? : daily/ almost weekly/ almost monthly/ almost never/ almost

7. On an average day how much time would you spend in the computer? : 0-1 hour 2-3 hours 4-5 hours more than 5 hours

8. How many times have you conferred with technical helper/ computer expert in your school in the past year? : 0-3 times 4-6 times 7-8 times more than 8 years

SECTION - B
(Computer Training & Knowledge)

Instruction:

The following questions relate to your personal experience with instructional computing about the computer training you received and the subsequent knowledge you gained. Please indicate your opinions as denoted numerically.

Opinions

Strongly Agree	5
Agree	4
Moderately Agree	3
Disagree	2
Strongly Disagree	1
Not Applicable	NA

5 4 3 2 1 NA 1. I think that my school district provides computer training opportunities to meet my needs for classroom instruction.

5 4 3 2 1 NA 2. In the past year I took advantage of the computer training opportunities for teachers provided by my school district.

5 4 3 2 1 NA 3. In the past year I took full advantage of the available computer training opportunities for teachers offered outside my school district. (including formal course work)

5 4 3 2 1 NA 4. In terms of instructional computers & technology, I feel that my school is relatively well equipped.

5 4 3 2 1 NA 5. When I use computers for classroom instruction, assistance is available in my school when needed.

5 4 3 2 1 NA 6. I see myself as one of the more knowledgeable computer users in my school.

5 4 3 2 1 NA 7. Other school personnel see me as one of the more knowledgeable computer users in my school.

SECTION - C
(Computer Comfortability)

Instruction:

The following questions relate to your personal experience with instructional computing. Please indicate your opinions as denoted numerically.

Opinions

Strongly Agree	5
Agree	4
Moderately Agree	3
Disagree	2
Strongly Disagree	1
Not Applicable	NA

5 4 3 2 1 NA	1.	I am comfortable using computers in my classroom.
5 4 3 2 1 NA	2.	I believe that using computers enhance my teaching abilities.
5 4 3 2 1 NA	3.	I feel comfortable discussing computer technology with my students.
5 4 3 2 1 NA	4.	I feel intimidated when students ask questions about computers.
5 4 3 2 1 NA	5.	I think Instructional computing will help improve students' overall performance.
5 4 3 2 1 NA	6.	I think that Computer Assisted Instruction (CAI) facilitates individualized instruction.
5 4 3 2 1 NA	7.	The large number of students in my classroom doesn't affect my ability to integrate computers into the curriculum.
5 4 3 2 1 NA	8.	By using computer technology in the classroom, I have increased my students' motivation.
5 4 3 2 1 NA	9.	I believe that the traditional methods of classroom is just as effective as with computer assisted instruction.

SECTION - D
(Computer Usage)

Instruction:

The following questions relate to your personal experience with computer usage for classroom instruction Please indicate your opinions as denoted numerically.

Opinions

Strongly Agree	5
Agree	4
Moderately Agree	3
Disagree	2
Strongly Disagree	1
Not Applicable	NA

5 4 3 2 1 NA	1.	I use the computer as a tutorial aid for students.
5 4 3 2 1 NA	2.	I use the computer for maintaining and updating students' records.
5 4 3 2 1 NA	3.	I use the computer to help students develop concepts.
5 4 3 2 1 NA	4.	I have my students use computers for problem solving.
5 4 3 2 1 NA	5.	I use the computer for students' drill and practice.
5 4 3 2 1 NA	6.	I teach instructional games by using the computer.
5 4 3 2 1 NA	7.	I use the computer as a general tool (word processing, spreadsheets etc.).
5 4 3 2 1 NA	8.	I use the computer as a way to access information (Internet, Database, CD ROM etc.).
5 4 3 2 1 NA	9.	I use Listserv (e-mail) as a teaching tool with the help of computer.
5 4 3 2 1 NA	10.	I teach students how to create and use presentation graphics that are available on the computer.
5 4 3 2 1 NA	11.	I plan curriculum instruction with the integration of computer technology in mind.